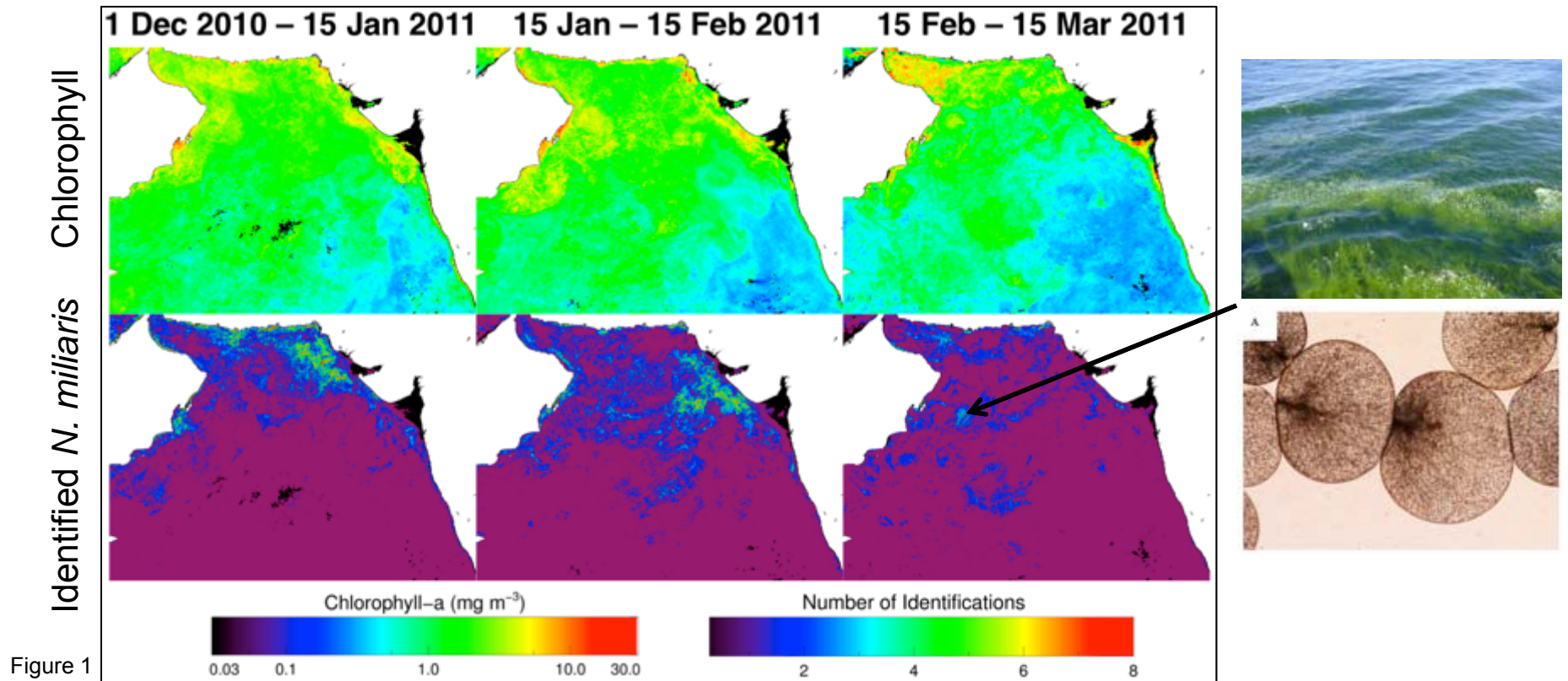




MODIS-Aqua reveals evolving phytoplankton community structure during the Arabian Sea Northeast Monsoon

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Applying a bio-optical model designed to identify the mixotrophic dinoflagellate *Noctiluca miliaris* to MODIS-Aqua revealed (1) patterns in its spatial distribution not previously seen (including its appearance in places not previously sampled), and (2) the surprising disassociation of total chlorophyll biomass with the presence of *N. miliaris*.



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Data Sources: Chlorophyll-a and the absorption coefficients of diatoms and *Noctiluca miliaris* at 443-nm from MODIS-Aqua.

Technical Description of Figures:

Figure 1: Progression of the geographic distribution of total chlorophyll and *Noctiluca miliaris* during the boreal Winter of 2010-2011 at 2 km resolution. Top row shows chlorophyll-a (mg m^{-3}) from MODIS-Aqua. Bottom row shows *N. miliaris* identified based on thresholds of the absorption coefficients of diatoms and *N. miliaris* at 443-nm from MODIS-Aqua. Regions of white and black indicate land and no satellite retrievals (including model failure). Three sequential time periods encompassing the Northeast Monsoon season are shown from left to right: 1 Dec 2010 to 15 Jan 2011, 15 Jan to 15 Feb 2011, and 15 Feb to 15 Mar 2011. The images of a surface bloom of *N. miliaris* (top right) and its cells (bottom right) are courtesy of J.I. Goes and H.R.G. Gomes (Columbia University).

Scientific significance, societal relevance, and relationships to future missions: Changes in phytoplankton community composition in the northern Arabian Sea during the annual Northeast Monsoon have been linked to the appearance of the mixotrophic dinoflagellate *Noctiluca miliaris*. This emergence is ultimately expected to alter predator-prey relationships of higher trophic levels, and thus, carbon export to the deep ocean. Records of *in situ* counts of *N. miliaris* only first appear in the late 1990s and remain discontinuous. The daily imagery provided by satellite ocean color instruments, however, provide time-series of sufficient length to allow retrospective analyses. Applying a bio-optical model designed to identify *N. miliaris* to MODIS-Aqua revealed (1) patterns in its spatial distribution not previously seen (including its appearance in places not previously sampled), and (2) the surprising disassociation of total chlorophyll biomass with the presence of *N. miliaris*. This MODIS-Aqua imagery provided substantial insight into *N. miliaris* (and other phytoplankton) dynamics that could not have been achieved by *in situ* sampling alone and pointed to specific places and times for targeted future studies.

